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Journal of the Society of Arts.

FRIDAY, AUGUST 9, 1867.

Announcements by the Council.

SOCIETY'S VISIT TO THE PARIS EXHIBITION.

The visit of the members to the Universal Exhibition, 1867, is now taking place, as follows:—

The visit will extend from Monday, the 29th of July, to Friday, the 16th of August.

A Reception Room has been provided for the use of the members at No. 43, Rue Saint Georges, where members can have their letters addressed, where they can write their letters, make appointments and arrangements, and where notices of any special matters connected with the visit will be suspended. Members are requested to register their names and addresses here on their arrival in Paris. Lists of Hotels will be provided.

Arrangements have been made by which the Members of the Society of Arts will, through the kindness of the proprietors, be admitted, on the presentation of their cards of membership, to inspect Imperial and Municipal establishments, factories, and workshops in the following list:—

His Excellency the Minister of Public Instruction has most kindly arranged for the Members visiting the Lycées of Paris, and has also further favoured the Society with tickets to view the exhibition of the works of the pupils in the Communal schools, and of the collections made by the Scientific Commission of Mexico.

The Director of the Imperial Mint (La Monnaie) has given instructions that members of the Society, when provided with their cards, which will be prepared for, the purpose, shall be admitted to that establishment on Tuesdays and Fridays, from twelve to three o'clock.

The Director of the Imperial Observatory has arranged that the Members presenting their cards of membership at that establishment shall be admitted on Saturdays, between half-past two and four o'clock.

Monsieur le Senateur Hausmann, Prefect of the Seine, has politely promised to make proper arrangements for the visits of the members to the catacombs, sewers, and municipal establishments.

Through the kindness of M. Belgrand, the water engineer to the City of Paris, permission has been obtained for members to visit the Waterworks of the City of Paris at Menilmontant.

The Director of the Public Ways and Promenades of the City of Paris has thrown open the horticultural and other municipal establishments in his department, and has most obligingly tendered his assistance to the members.

M. Le Play, Commissaire-General of the Universal Exhibition, has very kindly expressed his desire to aid the members in any way in his power.

The following gentlemen and companies have politely opened their establishments to the Society:—

MM. J. F. Cail and Cie., engineers, Quai de Billy, No. 48, and Grenelle. Any day of the week, from 6 to 11 a.m., and from 12 to 5.

M. F. Barbedienne has furnished tickets of admission to visit his bronze foundry and workshops, 63, Rue de Lancy, on any day in the week, from 6 a.m. to 5 p.m.

MM. Barbezat and Cie., foundries, 58, Boulevard Prince Eugene, and 95 and 97, Rue Richard-Lenoir. Open to the members without restriction as to the day or hour.

MM. Ch. Christofle and Cie., gold and silversmiths, 56, Rue de Bondy, will receive a party of the members on any day appointed by the Society, between 12 and 2 o'clock.

MM. Hachette and Cie.'s great publishing establishment will be open to members on any day, between half-past 8 and 11 o'clock, by presenting their cards to M. Fouret, a member of the firm.

M. Ch. Lahure, Imprimerie Générale, 9, Rue de Fleurus, on any day and at any hour, except between 12 and 2 o'clock.

MM. A. Chaix and Cie., printing establishment, 20, Rue Bergère, on Friday in each week.

MM. Mazaroz-Ribaillier and Cie., furniture manufacturers, Exhibition rooms, 20, Boulevard des Filles de Calvaire; manufactory, 4 and 6, Rue Ternaux Popincourt, freely open to the members.

MM. Thiboumery et Cie., Chemical Works, 190, Rue Croix-Nivert.

M. A. Piver, manufacturer of perfumery, 91, Rue de Flandre.

The Directors of the Compagnie du Chemin de Fer de Paris à Orléans have given leave for the members to visit their new passenger station and goods station, on presenting their cards of membership to M. Renault, Chief Architect of the Company, No. 1, Boulevard de l'Hôpital; or to M. Prevel, 42, Quai de la Gare; according as they desire to see the passenger station or the goods station.

The workmen's houses designed by H.I.M. the Emperor Napoleon III., and now in course of construction in concrete by Messrs. W. E. Newton (member of the Society) and E. C. Shepard, in the Avenue Daumesnil, near the Parc de Vincennes, may be inspected any day from 6 a.m. till 6 p.m. Mr. E. Newton, the resident engineer, is usually at the works from 10 till 4, but in his absence the foreman, M. Bourgignon, or his deputy, will afford members any information they may require.

Cards of membership, enabling members to take advantage of these arrangements, may be obtained on application to the Society's House, John-street, Adelphi, or at 43, Rue Saint Georges, Paris.

P. LE NEVE FOSTER, *Secretary.*

The following list of hotels will be found useful:—

IN THE NEIGHBOURHOOD OF THE TUILERIES.

Hôtel Meurice, 228, Rue de Rivoli.

„ Windsor, 226, „

„ Brighton, 218, „

„ Wagram, 208, „

„ Rivoli, 202, „

„ du Louvre, 166, „

ON OR NEAR THE PRINCIPAL BOULEVARDS.

Grand Hôtel, 12, Boulevard des Capucines.

Grand Hôtel des Capucines, 37, Boulevard des Capucines.

Hôtel Scribe, 1, Rue Scribe.

„ de Bade, 32, Boulevard des Italiens.

„ du Tibre, 8, Rue du Helder.

„ du Helder, 9, Rue du Helder, Boulevard des Italiens.

„ Brezil, 16, Rue du Helder.

„ de Lancastre, 22, „

„ de l'Amirauté, Rue Neuve Saint Augustin.

„ Choiseul, 7, Rue de Choiseul.

„ des Deux Mondes, 8, Rue d'Antin.

„ des Etats Unis, 16, Rue d'Antin.

„ de la Grande Bretagne, 14, Rue Caumartin.

RUE ST. HONORÉ, &c.

Hôtel de Lille et d'Albion, 223, Rue St. Honoré.

„ St. James, 211, Rue St. Honoré.

„ Choiseul, 241, Rue St. Honoré.

„ du Danube, 11, Rue Richepance.

„ Richepance, 14, Rue Richepance, near the Madeleine.

„ de l'Amirauté, 20, Rue Duphot.

RUE DE LA PAIX, PLACE VENDÔME, &c.
 Hôtel de la Paix, 32, Rue de la Paix.
 " Westminster, 11, Rue de la Paix.
 " Mirabeau, 8,
 " Bristol, 6, Place Vendôme.
 " du Rhin, 4, Place Vendôme.
 " Castiglione, 12, Rue Castiglione.

PALAIS ROYAL AND BOURSE.
 Hôtel des Etrangers, 3, Rue Vivienne.
 Grand Hôtel de France et d'Angleterre, 72, Rue Richelieu.
 Hôtel d'Angleterre, 56, Rue Montmartre.
 Bergère, 32, Rue Bergère.
 Grand Hôtel de la Marine, 3, Rue des Vieux Augustins.
 Grand Hôtel d'Albion, 20, Rue Boulo.
 Hôtel Boulo, 5, Rue Boulo.
 Grand Hôtel de la Bourse, 15, Rue Notre Dame des Victoires.

NEIGHBOURHOOD OF THE NORTHERN RAILWAY.
 Hôtel de Chemin de fer du Nord, opposite the Railway Station.

Grand Hôtel du Nord, 45, Rue Lafayette.
 Grand Hôtel de Strasbourg, 78, Boulevard de Strasbourg.
 Hôtel Violet, Passage Violet, Faubourg Poissonnière.
 BETWEEN THE WESTERN RAILWAY STATION AND THE MADELEINE.
 Hôtel des Etrangers, 24, Rue Tronchet.
 " Tronchet, 22,
 " Folkestone, 9, Rue Castellane.
 " Bedford, 17, Rue de l'Arcade.
 " de l'Arcade, 43, Rue de l'Arcade.
 " Navarin, Rue Navarin.

SOUTH SIDE OF THE SEINE.
 Hôtel d'Amsterdam, 59, Rue Saint André des Arts.
 " des Beaux Arts, 1, Rue Beaux Arts.
 " Bretagne, 20, Rue de Seine.
 " 46, St. André des Arts.
 " de Breteuil, 1, Rue Dauphin.
 " Clovis, 69, Rue Monsieur le Prince.
 " Suffren, Avenue Suffren, Champ de Mars.

RAILWAYS AND STEAMBOATS.—The terminus of the Auteuil and Exhibition Railway is at the Western Station, Place du Havre. 2nd class carriages only 50c., intermediate stations 40c. Trains leave the terminus at 27 minutes, and the Exhibition at 25 minutes past each hour; there is an extra up train at 5:57. The Circular Railway (Chemin de Fer de Ceinture) has stations all round Paris, and joins the preceding at Auteuil. The large omnibuses of the American Railway run from the Bourse, and carry passengers for the Exhibition to the Pont d'Alma. Steamboats run from the Place de la Concorde every quarter of an hour for the Exhibition. Landing stage on the Paris side of the Pont de Jena. Other steamboats ply between the Champ de Mars and the Ile de Billancourt. Landing stage on the lower side of same bridge.

NUMBERS OF HOUSES IN STREETS.—Even Nos. on right side, odd Nos. on left side of street, progressing in direction of the stream of the river, or commencing from the river in transverse streets.

POSTE RESTANTE.—Letters addressed "Poste Restante" to be applied for at the head post-office, 9, Rue Jean-Jacques Rousseau; but members can have their letters addressed to No. 43, Rue St. Georges.

CAB FARES IN PARIS.—Two kinds of cabs—single seat for two; double seat for four.

Fare either by the "hour" or the "course," at the option of the hirer ("course" any distance without stoppage).

Fares—Two-place cab, 2f. per hour; 1·50f. per course; four-place cab, 2·25f. per hour; 1·70f. per course.

Driver's usual gratuity, 5 sous per hour; 3 or 4 sous per course.

Extra charge between 12:30 night and 7 morning.
 " " when taken from "Remise" (coach-house).
 " " beyond the fortifications.
 " " for luggage.

Ticket containing full particulars of authorised charges always to be given by the driver on entering his cab.

OMNIBUS FARES.—30 centimes (3d.), inside; 15 centimes (1½d.), outside.

MONEY.—Gold:—20 francs, 10 francs, and 5 francs. Silver:—5 francs, 2 francs, 1 franc, ½ franc, and 20 centimes. Copper:—10 centimes (2 sous)=1d.; 5 centimes (1 sou)=½d. £1 = 25 francs, usual exchange.

ARTIZANS' VISIT TO PARIS.

Her Majesty's Government have granted to the Society of Arts, in aid of the fund now being raised by the Society for assisting workmen, specially selected from various trades, to visit and report on the Paris Exhibition, the sum of £500, conditional on the Society raising a like amount by public subscription.

The following is the list of subscriptions up to the present date:—

H.R.H. THE PRINCE OF WALES, President	£31	10	0
HER MAJESTY'S GOVERNMENT (conditional)	500	0	0
Society of Arts ..	105	0	0
Earl Granville, K.G. ..	5	0	0
Lord de L'Isle ..	10	0	0
Thomas Twining ..	2	2	0
Sir J. P. Boileau, Bart. ..	5	0	0
George Godwin, F.R.S. ..	1	1	0
Vice-Chancellor Sir W. Page Wood, F.R.S. ..	10	0	0
W. H. Bodkin (Assistant-Judge) ..	3	3	0
Sir Rowland Hill, K.C.B. ..	3	3	0
Benjamin Shaw ..	2	2	0
Alfred Davis ..	10	10	0
Eugène Rimmel ..	5	5	0
Frederick Mocatta ..	2	2	0
James Marshall ..	2	2	0
Robert Dawbarn ..	1	0	0
Henry Vaughan ..	10	10	0
Philip Sancton ..	5	0	0
Somerset A. Beaumont ..	5	0	0
Decimus Burton, F.R.S. ..	1	0	0
W. Botly ..	1	1	0
Professor Robert Bentley ..	2	2	0
John Stuart Mill, M.P. ..	1	1	0
G. F. Wilson, F.R.S. ..	2	2	0
Henry Creed ..	1	1	0
The Marquis of Salisbury, K.G. ..	10	0	0
D. Robertson Blaine ..	2	2	0
William Hawes ..	2	2	0
Seymour Teulon ..	1	1	0
G. N. Hooper ..	2	2	0
Lord Taunton ..	5	0	0
Henry Cole, C.B. ..	1	0	0
A. Robb ..	1	1	0
S. Andrews ..	1	1	0
Thomas Dixon ..	1	1	0
Charles Telford ..	1	1	0
Edmund Burke ..	2	0	0
W. H. Gore Langton, M.P. ..	5	0	0
J. R. Fowler ..	1	0	0
John Rutson ..	1	1	0
W. Fothergill Cooke ..	2	2	0
J. P. Gassiot, F.R.S. ..	5	5	0
The Duke of Devonshire ..	10	0	0
Messrs. Chawner and Co. ..	2	2	0
Chas. Brooke, F.R.S. ..	1	1	0
T. Chappell ..	2	2	0
C. Candy ..	2	0	0
Alfred Haines ..	2	2	0
Major-General Sir William Gordon, K.C.B. ..	2	2	0
Bartlett Hooper ..	2	2	0
F. Richardson ..	1	1	0
J. Sharples ..	3	3	0
Carry forward ..	£799	11	0

Brought forward £799 11 0
Henry Johnson,	2 2 0
C. Skipper, jun.	1 1 0
G. T. Saul	1 1 0
Alderman D. H. Stone	5 5 0
G. H. Walker	1 1 0
R. Worthington	2 2 0
A. W. Miles	2 2 0
J. Harris Heal	2 2 0
John Bell	1 0 0
Messrs. Mander and Co.	2 2 0
B. S. Cohen	1 1 0
John Corbett	1 1 0
J. Zaehnsdorf	0 10 6
Major-General Viscount Templetown, C.B.	5 0 0
J. Pearce	3 3 0
Messrs. Huntley and Palmer	2 2 0
A. Glendining, jun.	1 1 0
A. Trevelyan	2 2 0
S. Harrington	1 1 0
Montague Ainslie	2 2 0
James Bentley	2 2 0
Capt. R. P. Oldershaw	1 0 0
E. C. Tufnell	2 2 0
Samuel Redgrave	1 1 0
Joseph Lockett	2 2 0
Messrs. Spicer, Bros.	4 4 0
John Tolhurst	1 1 0
Lord Ebury	5 0 0
C. Lawson	1 0 0
John Horton	1 1 0
W. Baker	1 1 0
Henry Briggs	1 1 0
James Heather	1 1 0
H. Reader Lack	1 1 0
C. Silvy	1 1 0
William Browne	1 1 0
T. Kibble	1 1 0
C. Garland	1 1 0
Antonio Brady	2 2 0
<i>Collected in response to a Circular issued by the Birmingham Chamber of Commerce.</i>	
G. Dixon, M.P., Birmingham	5 5 0
Messrs. Smith and Wright, Birmingham	5 5 0
Messrs. Griffiths and Browett, Birmingham	5 5 0
Henry Weiss, Birmingham	2 2 0
W. H. M. Blews, Birmingham	2 2 0
W. Middlemore, J.P., Birmingham	5 5 0
Thomas Lloyd, Birmingham	2 2 0
Messrs. Elkington and Mason, Birmingham	5 5 0
Messrs. John Hardman and Co., Birmingham	2 2 0
Messrs. F. and C. Osler, Birmingham	5 5 0
The Proprietors of the <i>Birmingham Journal and Daily Post</i>	2 2 0
The Proprietors of the <i>Birmingham Gazette</i>	2 2 0
R. L. Chance, Birmingham	2 2 0
T. Avery, Birmingham	2 2 0
W. Tonks and Sons, Birmingham	2 2 0
W. Lucas Sargent, Birmingham	2 2 0
— Mountain (Messrs. Walter, May, and Co.), Birmingham	2 2 0
J. A. Williams, Birmingham	2 2 0
Henry Charlton, Birmingham	2 2 0
W. Bartlett and Sons, Birmingham	5 0 0
John P. Turner, Birmingham	0 10 6
W. H. Avery, Birmingham	2 2 0
Messrs. Peyton and Peyton, Birmingham	3 3 0
James Cartland, Birmingham	2 2 0
Messrs. Smith and Chamberlain, Birmingham	2 2 0
Messrs. Baker and Son, Birmingham	2 2 0
Messrs. Hinks and Wells, Birmingham	2 2 0
Messrs. Van Wart and Co., Birmingham	5 0 0
Messrs. Evans and Askin, Birmingham	2 2 0
C. Shaw, Birmingham	2 2 0
James Barwell, Birmingham	1 1 0
Total	£958 0 0

Messrs. J. M. Johnson and Sons have kindly placed at the disposal of the Council a number of their five-shilling English Catalogues of the Exhibition, sufficient to present each workman with a copy.

Subscriptions may be forwarded to the Financial Officer, at the Society's House.

The Council are now prepared to receive the names of any workmen recommended by their respective trades as fit and proper persons to undertake this important duty on behalf of their fellow workmen. A certain number have already been selected, and some of them are now in Paris.

Proceedings of Institutions.

BANBURY MECHANICS' INSTITUTE.—At the last half-yearly meeting, held March 21st last, the report presented spoke of the continued prosperity of the Institute. At the commencement of the half-year the Committee determined to arrange for a more systematic course of lectures during the winter months than in previous years, and the attendance has been a decided improvement upon past years. It appears that at the previous half-yearly meeting a question was raised, whether, from the absence of the mechanic element, the simple title of Institute, or Literary Institute, would not be more correct; and one of the earliest subjects considered by the committee was how the absence of mechanics could be accounted for, and what plan, if any, could be adopted to induce a larger number of these to unite themselves with the Institute. Negotiations were opened with the committee of the Recreation Society—the largest number of artisans in the town, and an offer was made, which, if accepted by the members of this Institute, would have brought a large increase to the number, and so removed the ground of complaint, as a very fair proportion of the members would have been strictly mechanics. At a full meeting of the committee the proposal was accepted, but at an extraordinary general meeting of the members of the Institute it was rejected, and so the matter rests. Books to the amount of £11 have been purchased for the library. During the half-year now elapsing the committee has been requested to take charge of a scientific library given to the town by Mr. Samuelson, and has devoted a room to this purpose, and they hope to receive from other gentlemen of the neighbourhood donations of scientific books, so as to constitute this a valuable library of reference. The balance-sheet shows that the total receipts have been £102 6s. 7d.; and payments £89 5s. 11d.; leaving a balance in hand of £13 0s. 8d.

BELFAST PEOPLE'S LITERARY INSTITUTE.—The report for last year says that there has been an increase in the number of subscribers; in January, 1866, there were 268, and in January, 1867, there were 288. The educational classes have been eminently successful, some of them having as many as 50 members; it is believed that they have been the means of inducing not less than 80 subscribers to join the Institute. They comprise English, book-keeping, arithmetic, mathematics, and French. The English class has been largely attended and highly appreciated by the pupils. The book-keeping class was opened for the first time, and has been most popular. The mathematical class has also been well attended. The Committee have at length obtained possession of the premises in Queen-street, belonging to the late Mechanics' Institute. They have consequently taken steps to have the entire premises let to the best advantage, and trust to have a still more favourable report to make at the next meeting. The treasurer's report shows that £12 has been received as donations during the past year; and the Committee intend continuing their efforts in this direction.

EXAMINATION PAPERS, 1867.

The following are the Examination papers set in the various subjects at the Final Examination held in April last:—

(Continued from page 593.)

MAGNETISM AND ELECTRICITY.

THREE HOURS ALLOWED.

1. Give some experimental illustrations of magnetic attraction, repulsion, and induction.
2. What are the *Isoclinal lines*? Describe the distribution of terrestrial magnetism.
3. How are the errors of a ship's compass ascertained? and by what means may the *quadrantal deviation* be corrected?
4. Explain the phenomena of diamagnetism; and mention some substances by which this property is most powerfully manifested.
5. In what manner are magnetic and electric energy directionally related? Illustrate the relation experimentally.
6. What are the leading properties of an electrified body?
7. To what phenomenon in light and heat is electrical induction analogous?
8. Explain the construction and action of an electrophorus.
9. What is meant by the potential of a voltaic current?
10. Explain the construction of Daniell's battery, and the reasons for its constancy.
11. Explain the construction of a thermopile, and state its chief uses.
12. What evidence does a thermo-electric element afford of the dynamic nature of electricity?
13. Explain the structure and action of the electric organs in some animal.
14. What relations exist between a voltaic current and muscular contraction?
15. Describe the construction of the Morse telegraph.
16. Describe the construction and use of a relay.
17. Explain the structure of some efficient submarine cable.
18. Explain the mode of testing a "fault" in an electric cable and assigning its locality.

LIGHT AND HEAT.

THREE HOURS ALLOWED.

GEOMETRICAL OPTICS.

1. Enunciate the law of the ordinary refraction of light at the surface of a transparent medium. When we look directly down through the surface of water at objects below the surface, show how to find their real depth compared with their apparent depth. Explain how a straight rod, placed obliquely in water, appears to an eye above it to be broken at the surface of the water.

2. Show what is the correct form for the mirror of a lighthouse, supposing the flame of the lamp to be very small. If the flame is large, what effect has that circumstance on the beam of reflected light? Show the construction of Gregory's reflecting telescope, with the positions of the images.

3. If a small diverging pencil of rays falls directly on a concave spherical surface of a *refracting* medium, show how to find the focus from which the refracted pencil diverges. Apply the result to find the effect of concave lenses on diverging pencils. Show how the images of objects seen through concave lenses appear diminished in magnitude.

4. Explain the construction of the Galilean telescope. Show how its magnifying power arises, and state its disadvantages.

PHYSICAL OPTICS.

5. State the evidence by which it is concluded that light is propagated with intervals which differ, for the different colours of the solar spectrum. What is the value, approximately, of the luminiferous interval in green light.

Describe some method of measuring the luminiferous interval for a given colour.

6. Explain the construction of the *double image rhomb*. Show how a polariscope is formed in the French instruments by means of a double image rhomb for the polarizer, and another double image rhomb for the analyzer. What advantages and disadvantages have these forms of polarisopes.

7. Explain what is meant by the diffraction of light. If a telescope, in focus to show distinctly the image of a distant luminous point, has a piece of wire gauze placed before the object-glass, describe the appearance seen on looking through the eye-glass. How are the appearances in this and similar cases explained?

8. When a plate of a *biaxal* crystal, cut perpendicularly to the line bisecting the angle between the optic axes, is placed between the polarizer and analyzer of the polariscope, describe the appearances witnessed when the eye is near the plate, for different relative positions of the polarizer and analyzer. Give the names of some biaxal crystals.

HEAT.

9. Explain what is meant by the *conduction* of heat. Describe some method of determining the conducting powers of solid bodies. Give the names of some of the substances which have the best conducting powers for heat in their order.

10. Explain the cause of the discrepancies in the readings of the spirit, the mercurial, and the air thermometers. Which of these has been generally taken for the standard thermometer to which the others are compared? Give the reasons for that choice.

11. Describe a method of measuring the elastic force of the vapours of liquids at high temperatures, and generally when it is greater than that of the atmosphere. How have many of the gases been brought to the liquid and some to the solid state?

12. Explain the construction and mode of action of the *high pressure* steam engine. Show the circumstances in which it becomes the most advantageous form of steam-engine.

CHEMISTRY.

THREE HOURS ALLOWED.

No candidate is allowed to answer more than three questions in each division.

FIRST DIVISION.

1. How is chlorine usually prepared? What impurities is it liable to contain?

2. What are the chief constituents of coal gas? How can each of them be obtained in a pure state?

3. Is atmospheric air a compound or a mixture? Describe experiments by which you could prove the correctness of your opinion?

4. Describe and explain a process for the preparation of sulphuretted hydrogen? Describe by equations the action of the gas in the following compounds, viz.: potassium hydrate, ferric chloride, arsenious acid.

5. How are nitrates detected when present in large quantity? How are mere traces of them detected?

6. What weight of air is needed for the complete combustion of a ton of carbon?

SECOND DIVISION.

1. What are the common constituents of pig iron? How is pure iron obtained on a large scale?

2. What is the most abundant ore of antimony? What are its most characteristic chemical reactions?

3. Describe the preparation and properties of the several substances denoted by the formula $Hg Cl_2$, $Hg^2 Cl_2$, HgO , HgS ?

4. A white precipitate is obtained by the addition of hydrochloric acid to a solution containing metallic salts? What may the precipitate contain; and how would you examine it?

5. How is bleaching-powder made? What compounds does it contain? How would you judge of its quality?

6. How is lime separated from magnesia ?

THIRD DIVISION.

1. Describe the manufacture of acetic acid ; also the reactions of the acid ?
2. How is glycerine obtained from tallow ? Give its formula and chief reactions ?
3. A given sample of cane sugar is suspected to contain some uncrystallisable sugar. How would you ascertain whether such is the case ?
4. Describe the preparation of tannin from gall-nuts ? What is the action of dilute sulphuric acid in tannin ?
5. How would you separate starch and woody fibre ?
6. Describe the process of dyeing by indigo ?

MINING AND METALLURGY.

THREE HOURS ALLOWED.

1. Describe the various ores of zinc, and their usual method of occurrence.
2. From what source is the principal supply of silver derived ?
3. How would you determine the amount of lead contained in a sample of rich galena ?
4. Describe the method of smelting iron ores in the blast furnace.
5. Describe the process employed for smelting lead ores, with the addition of metallic iron.
6. Name the most important ores of iron, and give their several compositions.
7. What do you understand by a mineral vein ?
8. Describe the mechanical preparation of copper ores.
9. How is coke prepared from small coal or *slack* ?
10. Describe the method of securing a pit with iron *cribbing*.
11. By what process is steel usually manufactured in this country.
12. Describe the *Patio* process of amalgamation.

(To be continued.)

TECHNICAL EDUCATION.

The following report has been made by the Schools Inquiry Commission :—

We, the Commissioners appointed to inquire into the education given in schools not comprised within the scope of your Majesty's two recent Commissions of Inquiry into the state of Popular Education, and of certain public schools, bearing date respectively the thirtieth day of June in the twenty-second year, and the eighteenth day of July in the twenty-fifth year of your Majesty's reign, humbly submit to your Majesty the following Report :—

Our attention has been incidentally called to the evidence considered to be afforded by the International Exhibition at Paris, of the inferior rate of progress recently made in manufacturing and mechanical industry in England compared with that made in other European countries. It has been stated to us that this alleged inferiority is due in a great measure to the want of technical education, and we have therefore thought it desirable to ascertain from many eminent English jurors in this department whether they agree with this opinion.

We think it expedient at once to report to your Majesty the answers which we have received to our inquiry on this point. Although they have an obvious bearing on the propriety of encouraging to a large extent the study of physical science in our schools, and especially in schools used by those classes which are probably destined to the pursuit of manufacturing industry (a question which had already engaged much of our attention, and to which we hope more fully to advert in our general report), yet we have not considered that an inquiry into technical education came directly within the scope of our Commission, nor could we now undertake it without interposing a longer delay in making our

report than we should wish. But considering the great importance of the subject, we venture to suggest for the consideration of your Majesty's Government whether a special inquiry into the state and effects of technical education abroad, and particularly in France, Germany, and Switzerland, should not be instituted, in whatever manner may appear to your Majesty's Government best calculated to obtain full and accurate information about it. Witness our hands and seals this second day of July, 1867.—Taunton, Chairman ; Lyttelton ; W. F. Hook ; F. Temple ; Anthony W. Thorold ; Thomas Dyke Acland, jun. ; Edward Baines ; W. E. Forster ; P. Erle ; John Storrar ; H. J. Roby, Secretary.

To this report is appended the following correspondence :—

From Dr. Lyon Playfair to Lord Taunton, Chairman of the Schools Inquiry Commission.

[This letter has already appeared in the *Journal* of June 7th.]

(CIRCULAR.)

Schools Inquiry Commission, 2, Victoria-street, S.W.,

May 30, 1867.

SIR,—I am instructed by Her Majesty's Schools Inquiry Commissioners to send to you a copy of a letter lately addressed to their chairman by Dr. Lyon Playfair, and to request that you will favour them by stating whether you agree with the substance of that letter.—I have, &c., H. J. Roby.

The above circular was sent to some eminent jurors and others. The answers which have been received are from the following gentlemen. The name of the subject with which they were respectively connected is added in italics :—

Dr. David Price. (*Iron.*)
Prof. Tyndall, F.R.S., Royal Institution, Albemarle-street. (*Physics.*)

J. E. McConnell, C.E. (*Locomotives.*)
James Young, Esq., of Limefield by West Calder. (*Chemical Manufactures.*)

J. Scott Russell, Esq., F.R.S. (*Naval Architecture.*)
Captain Beaumont, R.E., Junior United Service Club. (*General Machinery.*)

Peter Graham, Esq., of Jackson and Graham's, Oxford-street. (*Furniture and Carpets.*)

E. W. Cooke, R.A. (*Glass and Artistic design.*)

E. Huth, Esq., of Leeds. (*Woollens.*)

W. Spotten, Esq., Belfast. (*Flax.*)

R. Mallet, Esq., C.E. (*Engineering.*)

Rev. Canon Norris, M.A. (*Education.*)

Prof. Frankland, F.R.S., Royal Institution, Albemarle-street. (*Chemistry.*)

John Fowler, Esq., Pres. I.C.E.

Warington W. Smyth, Esq., F.R.S., School of Mines, Jermyn-street. (*Mining.*)

A. J. Mundella, Esq., Nottingham. (*Hosiery, &c.*)

1. *From Rev. Canon Norris, M.A., late one of her Majesty's Inspectors of Schools.*

June 3, 1867.

MY LORD,—During my four weeks' work at Paris as the English juror of Class 89 (primary instruction), I had more than one conversation with English jurors of other classes on the subject to which Dr. Lyon Playfair's letter has invited your lordship's attention.

Two questions are raised by that letter :—

1. Is England really losing her advanced position in those industries which involve the application of science to production ?

2. If so, is it due to our comparative backwardness in the teaching of what, for shortness sake, is called applied science ?

In reply to the first question I must say that, without any exception, it seemed to be the impression of those with whom I spoke on the subject. Only with special reference to one of the grounds on which Dr. Playfair bases his judgment I would venture to suggest some caution. I do not think that a comparison of the awards made to the several nations by the International Jury is a trustworthy evidence of the respective merits of those nations.

The upshot of my experience of the jury work was this, that these international exhibitions had already outgrown the conditions under which the justice of such awards could be considered at all certain.

However, Dr. Playfair's opinion is by no means made to rest on this ground only. He speaks from a large and independent knowledge of the subject; and, as I have said, I found the opinion universal among those with whom I spoke.

I come then to the second question:—Assuming that we are making less industrial progress than France, Austria, and Prussia, how far is this due to England's backwardness in the technical education of her artizans?

And here, very deliberately, I must confess that my examination of the things sent from Austrian, French, and Prussian schools, compared in my own mind, not with what England sent (for we were not at all fairly represented), but with my own knowledge of what England might have sent, led me to believe that while in the matter of primary education we were (to say the least) well abreast of those three nations, yet in the matter of higher instruction, of all that tends to convert the mere *workman* into the *artizan*, Austria, France, and Prussia were clearly passing us.

I have, &c., J. P. NORRIS.
The Lord Taunton, &c., &c.

2. From John Tyndall, Esq., F.R.S., Professor of Physics in the Royal School of Mines.

June 3, 1867.

SIR,—I hardly think that an Exhibition in Paris furnishes the means of accurately testing the comparative merits of English and French education.

The simple inconvenience of transport tends to render England worse represented than France.

Still on other grounds I would express a general concurrence in the views of Dr. Playfair. The facilities for scientific education are far greater on the Continent than in England, and where such differences exist, England is sure to fall behind as regards those industries into which the scientific element enters.

In fact, I have long entertained the opinion, that in virtue of the better education provided by continental nations, England must one day—and that no distant one—find herself outstripped by those nations, both in the arts of peace and war. As sure as knowledge is power this must be the result.

I am, &c., JOHN TYNDALL.
H. J. Roby, Esq., &c., &c.

3. From Edward Huth, Esq.

Oakfield Lodge, Huddersfield,
June 3, 1867.

SIR,—I have read with much interest the letter of Dr. Lyon Playfair, addressed to Lord Taunton, on the industrial or want of industrial education in England, a copy of which was enclosed in your favour of the 31st of May. The great experience and high authority of Dr. Playfair might almost be sufficient to prove his case. I, as a humble individual, can only say that I agree with him *in toto*.

Having closely examined the woollen textile fabrics during the Exhibition in 1851, and having acted as juror for these fabrics in the Exhibition of 1862, as well as the present one in Paris, I had opportunities of comparing the progress that has been made by various countries in this important branch of industry.

I am sorry to say that, although we may still be unsurpassed in many of our productions, we no longer hold

that pre-eminence which was accorded to us in the Exhibition of 1851.

Although an industry which has attained a considerable state of perfection does naturally not advance in ten years as rapidly as the one which was at that period less fully developed, I fear that the enormous strides that have of late been made by our continental rivals in France, Belgium, Prussia, and Austria, will make it daily more difficult for our woollen manufacturers to hold, not only their former prominent position, but even in many cases to maintain their present one.

It is high time that not only the Government, but that every individual who loves his country should make thorough inquiries into the causes of such a state of things.

Like Dr. Playfair, I made it a point during my stay in Paris to converse with many English as well as foreign jurors on this point.

I found my (for a long time previously entertained) convictions entirely confirmed, that it is the want of industrial education in this country which prevents our manufacturers from making that progress which other nations are making. From all I could see and learn I found both masters and foremen of other countries much more scientifically educated than our own.

This, however, is not all. The workmen themselves of other countries have a far superior education than ours, many of whom have none whatever. Their productions show clearly that there is not a machine working a machine, but that brains sit at the loom, and intelligence stands at the spinning wheel.

Seeing and feeling the results of this as thoroughly as I do, you must permit me for one moment to travel beyond the contents of Dr. Playfair's letter, and ask of what use is an industrial scientific education to our working population if they have not had a good elementary education to begin with?

This, I know, opens a wide and fruitful subject of controversy, but one which one day must be grappled with, and the sooner this is done the better it will be for England.

Voluntary education has done much, but the progress is too slow, and the great question is, whether compulsory education must be resorted to.

This, I know, will grate harshly on many an ear, and so it did on mine some years ago.

Seeing what it has done for other countries, and being convinced that a good general education is the great secret of their rapid strides in art and manufacture, I have entirely changed my opinion, and I am glad to say that the many eminent men in different stations of life with whom I have conversed in Paris on this subject are all of the same opinion.

Let wiser heads than mine find out the right way to accomplish this and to make it acceptable to all.

Let this national elementary education once be established throughout the country, and you have a fine nucleus for scientific industrial schools, in nearly all our manufacturing towns at least, in our Mechanics' Institutions, wherever such institutions are properly conducted.

Pray excuse me for going so far beyond the inquiry contained in your letter; my only plea for doing so is the deep interest I feel in education and the advancement of all branches of industry in England.

I have, &c.,
EDWARD HUTH.
H. J. Roby, Esq.,
Schools Inquiry Commission, London.

4. (Second Letter.)

Oakfield-lodge, Huddersfield,

July 1st, 1867.

SIR,—A short absence from home prevented me from returning the enclosed sooner.

To avoid misunderstanding I desire to make only one remark in explanation of what I say about Mechanics' Institutions forming a nucleus for scientific industrial schools.

Of course I do not mean to say that our Mechanics' Institutions could do the work of the higher industrial schools, which I should like to see established by Government for those who are able to pay a reasonable price for the instruction they receive in them.

But if a general system of sound elementary education were to be introduced in this country, our Mechanics' Institutions could take a far higher standing in the promotion of scientific instruction to the really working population, instead of being compelled, as they now are, to confine themselves almost exclusively to elementary instruction.

I have, &c.,
EDWARD HUTH.

H. J. Roby, Esq., &c., &c.

5. From *Edward Frankland, Esq., F.R.S., Professor of Chemistry in the Royal School of Mines.*

Royal College of Chemistry, 315, Oxford-street, W.
June 4, 1867.

SIR,—I am favoured with your communication of the 31st ult., enclosing a letter addressed by Dr. Lyon Playfair to the Chairman of Her Majesty's Schools Inquiry Commissioners, and requesting me to state whether I agree with the substance of that letter. In reply I beg to say that Dr. Lyon Playfair's communication substantially expresses my own convictions in regard to the matters therein mentioned.

As a juror in Class 44 of the present Paris Exhibition, I was not only forcibly struck by the want of evidence of progress in the different branches of chemical manufactures carried on in Great Britain, but still more so at the great advances made by other nations, but more especially by Germany, France, and Switzerland, in respect of such manufactures since the year 1862, when, as a juror in the corresponding class, I had also an opportunity of comparing the chemical manufactures of different nations.

I quite agree with Dr. Playfair in referring this want of progress in the manufactures of this country chiefly to the almost utter lack of a good preparatory education for those destined to take part in industrial pursuits. This great defect in the school and college education of England affects the masters and managers of our factories even more deeply than the workmen themselves. The former have but rarely had any opportunities of making themselves acquainted with the fundamental laws and principles of physics and chemistry; they therefore find themselves engaged in pursuits for which their previous education has afforded them no preparation, and hence their inability to originate inventions and improvements. It is true that such men not unfrequently imagine themselves inventors, and the yearly files of patent specifications abound with instances of their so-called inventions. The great loss of time and money attending these futile patents would be rendered impossible by a very moderate, if accurate, knowledge of chemical and physical science.

In the polytechnic schools of Germany and Switzerland the future manufacturer or manager is made familiar with those laws and applications of the great natural forces which must always form the basis of every intelligent and progressive industry. It seems that at length this superiority in previous training is more than counterbalancing the undoubted advantages which this country possesses in raw material.

I have, &c.,
E. FRANKLAND.

H. J. Roby, Esq., &c., &c.

6. From *John Fowler, Esq., Pres. I.C.E.*

2, Queen-square-place, Westminster, S.W.,
June 5, 1867.

SIR,—I find it difficult to answer your question precisely in the terms in which you put it.

I do not quite agree with Dr. Playfair that a comparison can be usefully made between Exhibitions so nearly together in time as those of 1862 and 1867, nor that "little inventiveness" and "little progress" in the peaceful arts have been lately made by this country.

With these reservations, however, I may say that I

agree generally with that which may be considered the substance of the letter, viz., that foreign nations have made greater manufacturing progress than England since the Exhibition of 1851.

This, in fact, was the opinion which I publicly expressed on the 8th May, at the annual dinner of the Institution of Civil Engineers, and I have been glad to see a confirmation of it by Dr. Playfair and others.

I am, &c.,
JOHN FOWLER.
H. J. Roby, Esq., Schools Inquiry Commission,
2, Victoria-street.

7. From *James E. McConnell, Esq., C.E.*

Dean's-yard, Westminster, S.W.,
June, 7, 1867.

SIR,—I have read Dr. Lyon Playfair's letter to Lord Taunton on the subject of the position which England occupies in the great industrial competition in Paris.

I agree with Dr. Playfair in his views generally, and am satisfied as to the comparatively small progress we have shown since 1862, and the great advance which continental nations have made during that period.

In the class of which I was juror for England (No. 63) I made a very careful examination and comparison of our locomotive engines, carriages, and railway machinery, apparatus, and material as shown by this country, with the same articles exhibited by France, Germany, and Belgium.

I am firmly convinced that our former superiority either in material or workmanship no longer exists; in fact, there are engines shown there made in France and Germany equal to those of the best English makers.

It requires no skill to predict that, unless we adopt a system of technical education for our workmen in this country, we shall soon not even hold our own in cheapness of cost as well as in excellence of quality of our mechanical productions.

I found that on the Continent there are now a number of workmen's schools established, in which a clever mechanic can qualify himself for any scientific position in his business.

In England our Mechanics' Institutions are more like reading clubs. Classes are neglected, and in consequence when a good workman is selected for a foremen's place, he is generally found wanting in technical knowledge.

We have treated our workmen too much like a machine, but this must be remedied if we are to maintain our ground.

Having for about 25 years superintended large numbers of English workmen, I can speak on this point practically.

Fully impressed with the great importance of this subject, I invited several of my brother jurymen and exhibitors to meet at our hotel in Paris, to consider the best course to adopt in the matter. At one of these meetings we had the pleasure of Dr. Playfair's attendance.

I may mention that I hear a movement has already begun to draw the attention of the public in England to the subject, and sums of money have been offered by individuals to assist the object. It appears to me, however, that Government should take the matter in hand, and the public funds should be forthcoming to establish these technical schools, not in London, but in the districts where the operations requiring such knowledge are being carried on.

Thus there ought to be mining schools in South Wales, Staffordshire, and Durham, and machinery and engine schools in like manner placed in Manchester, Glasgow, &c., &c.

It will afford me much pleasure, and I shall be ready to be of service if required in this matter in which I feel the greatest interest, and know to be nationally of vital importance.

I have, &c.,
JAMES E. McCONNELL.

H. J. Roby, Esq., &c., &c.

8. From Capt. Frederick Beaumont, R.E.

71, Avenue Champs Elysées, Paris,
June 10, 1867.

SIR,—In reply to your letter of the 30th ultimo, in which you are good enough to ask, by order of Her Majesty's Schools Inquiry Commissioners, my opinion on a letter addressed to them by Dr. Lyon Playfair, I have the honour to state that in the substance of that letter I concur. Speaking only with reference to machinery, the department with which I am immediately connected, there can be no doubt as to the immense strides which foreign mechanical engineering has lately made, notably, I think, in the case of France and Belgium, and by which they are rapidly overtaking the industrial power of Great Britain.

My impression is that this advance has been greatly owing to a successful copying of English designs, and to the use of English machine tools. Of course, did the foreigners merely confine themselves to copying, they would never surpass us, but while following that which in our mechanical designs is good, they are also seeking (and that not unsuccessfully) to apply theoretical knowledge in a way which, to my humble judgment, shows that they will soon have little to learn from us.

I would allude notably to the economical use of steam, though no doubt their inventive faculties have there been quickened by the high price of fuel on the Continent. I cannot, from my own knowledge, speak of the means of instruction available to the working public abroad, but I have always understood it to be superior to our own; and assuming it to be so, I cannot conceive any reason which would better than that account for a difference of industrial progress.

I trust I may not be deemed presumptuous in stating what I believe to be a very great want in England, viz., such an institution as the well-known "Arts et Métiers" of Paris. I know of no national institution where the public of our own country may study practical mechanics and the arts appertaining thereto. Such a one would, in my opinion, be valuable, not only to working men and their superiors, but to engineers. It should be an evidence of the most advanced mechanical knowledge of the country; and while teaching primarily through the eye by the models and machines exhibited, it would naturally form the focus of other means of instruction by lectures, classes, &c.

I apprehend it is only when taken up by Government that such an institution would assume proportions sufficient to be really effective as a means of national education.

I have, &c.,

FRED. BEAUMONT,
H. J. Roby, Esq., &c., &c. Capt. R. Engineers.

9. From Warington W. Smyth, Esq., M.A., F.R.S., Lecturer on Mining and Mineralogy in the Royal School of Mines.

28, Jermyn-street, S.W.,
June 14, 1867.

SIR,—I have the honour to acknowledge the receipt of your letter of the 31st ultimo, inquiring, for Her Majesty's Schools Inquiry Commissioners, whether I agree with the substance of Dr. Playfair's letter of the 15th ultimo, addressed to Lord Taunton.

Having gone carefully, as juror, through the objects exhibited in Class 47 at the Paris Exhibition, and having also examined with much interest many of the productions in Class 40, as well as other portions of the Exhibition, I am bound to admit that our British portion of the display was generally meagre and defective, partly from tolerably obvious causes. I was not so much struck by this lack of fair representation of many of our branches of industry, as I was by the decidedly greater progress which has been made of late years by several of the Continental nations, and that too in several departments which used formerly to be considered almost exclusively our own.

As regards the broad question of technical education, I will only add, that the greater proportional advance-

ment made by France, Prussia, and Belgium in mining, colliery working, and metallurgy, appears to me to be due, not to the workmen, but in great part to the superior training and attention to the general knowledge of their subject, observable among the managers and sub-officers of the works. No candid person can deny that they are far better educated, as a rule, than those who hold similar positions in Britain. I have, &c.

WARINGTON W. SMYTH.

H. J. Roby, Esq., &c., &c.

(To be continued.)

PARIS EXHIBITION.

The collection of arms has just been increased by an enormous cannon, produced at the Imperial foundry at Ruelle, within the last few months; it consists of a cast-iron body, strengthened by two steel coils. The weight of this piece, which is intended for port service, is said to be 37 tons; the diameter of the chamber is rather less than 17 inches; it is a smooth-bore breech-loader. Its projectiles are, a solid spherical shot, of 600lbs. weight, and a shell of the same form, weighing 420lbs., and containing 18lbs. of powder; and the charges for the two respectively 100lbs. and 66lbs. It is mounted on a cast-iron carriage; and a small crane, like that employed in England, fixed on one side of the carriage, serves to place the projectile in the mouth of the gun. This enormous piece of ordnance is of a long, bottle-like shape, longer in proportion to its diameter than either the Prussian or English monster gun. The weight of the carriage and its appurtenances is given as 29 tons, making a total weight of 66 tons. The gun stands close to the bridge which crosses the quai and facing the river, and around it are arranged specimens of the various pieces used in the French navy, namely, rifled cast-iron guns of 27, 24, 19, and 16 centimetres calibre, and bronze 12 and 4-pounders for gun-boats. It is a formidable exhibition.

The Emperor and Empress have recently paid a visit to the great Omnibus restaurant in the grounds of the Exhibition, and the Duc de Persigny and some other gentlemen dined there the other day *incognito*, partaking of the ordinary fare, in order to test the quality. A report has also been made, by order of the Imperial Commission, and a few extracts from this document will be found interesting, and may be of service to English workmen visiting the Exhibition.

Since the 8th of April, when the restaurant was opened, the number of customers amounted to 365,000 persons, who have spent in all 494,500 francs, giving an average of 3,600 meals per day, at the rate of 1s. 2d. each. The report only comes down to the middle of July, since which time, it is said, the number of daily visitors has reached an average of 5,713. The extent of the establishment is indicated by the preceding figures, but it may be added that the number of persons employed there amounts to 220. Numbers of the delegates from the French provinces and foreign countries, bodies of working men from various factories, orpheonists, and military musicians, have made use of the restaurant, and the dinners served to them have varied from 1s. 2d. to 2s., the highest price. Most of the visitors to the Exhibition have tested the Omnibus restaurant, and the reports are generally very favourable, especially as regards the abundance to be had for the money expended, and the civility of the attendants, who are almost all women. It should be added that visitors are not fixed by any rule, but may merely take a basin of soup if they please. The prices of the dishes have already been given in the *Journal*.

Amongst the means which have been brought in aid of the visits of the working classes, the encampment, established by a commission formed for the special purpose of encouraging such visits, deserves to be specially mentioned. It is close to the Exhibition, in the Avenue Rapp, and consists of a series of wooden huts, arranged

much in the same way as in a camp, and comfortably fitted up. The military musicians from various countries who visited Paris recently, were accommodated, to the number of 650, in the encampment for fifteen days, without any inconvenience; these musicians included Austrians, Prussians, Russians, Spaniards, Dutch, Bavarians, and Belgians. About 500 men from Perche, in the Orme, are now installed in the camp.

The grand banquet of the exhibitors, at which, it is said, the Emperor will be present, is at last definitely fixed for the 16th inst. It is expected that there will be twenty thousand persons present. It is to be held in the Hippodrome.

Fine Arts.

SCHOOLS OF ART.—It is reported that 99 schools of art are now in operation, five of which are new during the last year. Upwards of seventeen thousand students are receiving instruction in art in these central schools, and the total numbers taught drawing in all central schools, schools for the poor, and night classes, are over one hundred and five thousand. The fees received exceed eighteen thousand pounds. These figures, after due allowance made under recent minutes, indicate some slight increase on previous years. It is also reported that the art scholarships, lately instituted for the purpose of making the art schools of the country and the art collections at South Kensington bear more directly on manufactures and industries, have attained the end contemplated. It appears that two national art scholars are engaged in carrying out the decorations of the Kensington Museum, and two more are also now modelling decorations in terra-cotta for the Wedgwood memorial in the Potteries. Students in the etching class are under the instruction of Mr. Lane, A.R.A. Thirty-nine art schools throughout the country, that is, more than one-third of the total number, have borrowed works from the Kensington Museum as aids to study. Under recent minutes thirty-two "night art classes" have been established, for pupils above 12 years of age, in parochial schools and working men's institutions, which number is after the rate of nearly one night class for three towns possessing central schools throughout the country. Schools for the poor have now control over the art instruction of their pupils, and assist in the conduct of annual examinations. It appears that 560 of such schools have already availed themselves of recent provisions made in furtherance of national art education, and that 80,084 children in these schools have been taught drawing during the past year. The number of prizes awarded to art schools and classes generally has considerably diminished; the Department, it was understood, considered that prizes had of late been in excess.

THE PARIS EXHIBITION.—The select committee appointed to consider and report on the advisability of making purchases from the Paris Exhibition for the benefit of the Schools of Science and Art in the United Kingdom, and any other means of making that Exhibition useful to the manufacturing industry of Great Britain and Ireland, have considered the matters to them referred, and agreed to the following report:—
"1. They are of opinion that it is desirable that purchases should be made at the Paris Exhibition of objects of art and science, especially of such as illustrate modern scientific inventions and discoveries, and the application of art to manufactures, and that the exhibition of such objects in the Museum of South Kensington, and, by circulation, in local museums in different parts of the United Kingdom, would be useful to the manufacturing industry of the country, and for the artistic and scientific instruction of the schools in connexion with the Science and Art Department. 2. That as one of the principal objects of such purchases should be to show the progress made by other nations in manufactures, and in the appli-

cation of art and science to practical purposes, examples of foreign origin should, in the first place, be secured in preference to those of British production. 3. That it is not desirable that pictures and modern statuary sculpture should be purchased. 4. That, considering the importance of such purchases to the development of the manufactures and trade of the United Kingdom, they recommend that a liberal grant be asked from Parliament for the purpose of making them. They have not sufficient data before them to enable them to suggest the sum which might be advantageously expended, but they consider that under no circumstances should it exceed £25,000. 5. Lastly, they are of opinion that no objects should be purchased at the Paris Exhibition except such as shall be recommended by a commission consisting of gentlemen distinguished for artistic and scientific attainments, who should consult with the two art referees attached to the Department of Science and Art, and other competent persons. They further think it desirable that the referees should furnish written reports upon the objects recommended by them for purchase."

Manufactures.

FRENCH WAGES AND WORKMEN.—A report rendered to the Foreign-office this year by Mr. Julian Fane, secretary of embassy at Paris, speaks of wages of skilled artizans in various towns in France as ranging from 5f. to 10f. a day; for inferior workmen, from 2½f. to 3½f.; for workwomen in a clothing establishment, from 2f. to 4f. or 5f.; for children, from 1f. to 2f. The general rate of money wages in France may be said to have increased about 40 per cent. in the last 15 years, but the rise in money wages has been accompanied by a very considerable rise in the price of the ordinary articles of consumption and in rent of lodgings, so that the improvement in the position of the labourer, meaning his power to supply himself with the necessaries and comforts of life, has been far from commensurate with the rise in the money value of his labour. Still, the relative proportions in which money wages and the price of commodities have risen leave a margin in favour of the former, and to this extent there has been a rise in real wages, enabling the labourer to feed, lodge, and clothe himself somewhat better than he could 15 years ago. This has been the natural consequence of the rapid development of industrial enterprise and the increased demand for labour; and it may also have been affected by the greater facilities afforded to the labourer by the influence of opinion, and recently by legislation, to claim a larger share in the profits of production. It is difficult to estimate the relative price of labour in England and France. The rate of money wages may be higher in one country than in the other, but no just comparison can be instituted unless the quantity and quality of labour supplied in each case are fairly appraised. It is a question which only experts can decide, and they differ upon it. Combinations to influence the rate of wages were formerly punished in France as misdemeanours, but three years ago a law was passed, under which they are not illegal unless accompanied by violence (including insults), or menace, or fraudulent manœuvres, including false representations. Ample advantage has been taken by the workmen of this change in the law. There is scarcely a trade in France whose members have not combined in the last three years for the purpose of increasing the rate of wages and diminishing the duration of labour, and their efforts to this end have usually met with success. The employers, for the most part, assert that the law has proved to them an unmitigated evil, submitting them to the tyrannous coercion of the employed. Various forms of the co-operative system are in course of trial in France, with a view to prevent or lessen this collision of interests. The association of masons, for instance, is one that has met with remarkable success;

some of the workmen are shareholders, and others are engaged as ordinary labourers, and have no share in the profits, while some members of the association are simply holders of capital. In other establishments the workmen are allowed to share in the profits of the business by means of rewards or prizes allotted to them, or to the more worthy among them, by the proprietors at the end of the year, or by facilities for procuring food, clothing, lodging, and education for their children on advantageous terms. Mr. Fane gives it as his judgment that the fault in the organization of the co-operative societies has been generally too much faith in the combination of skill and labour, and too little regard for the advantage of capital; and that the workman should aim at becoming, in some measure, a capitalist himself, by the aid of societies of consumption enabling him to effect savings in expenditure, before he seeks to become a co-operator with the capitalist in industrial enterprise.

Commerce.

THE CENTRAL PACIFIC RAILWAY.—The chief difficulties apprehended in the construction of the great railroad to the Pacific, high mountain crossings and winter snow obstructions, seem to have been, to a large extent, overcome. The two mountain ranges had to be crossed at elevations of over 7,000 feet, or nearly three times the height of any railway lines hitherto built in America. Experience shows that it is entirely practicable, and that the deep snows are not likely to prove very serious obstacles. The Central Pacific Railroad of California, the western end of the great national route, commencing at Sacramento in 1863, encountered, at the outset of its career, the mountain difficulty in its worst form; the dreaded Sierras had to be overcome within the first hundred miles. In November last, however, it had carried its track nearly to the summit, and had demonstrated the feasibility of the whole mountain passage with less average engineering resistance than that with which the Alleghanies are crossed. During an unusually severe winter it has been successfully worked as far as built. It has had large working parties on the Summit Pass, so as to convince its officers that the fear of impassable snow-drifts is groundless. Only three days have the trains failed to make the regular trips. From Sacramento to Cisco station, the present terminus, is 94 miles, in which 5,911 of the total 7,042 feet of ascent is made. This portion embraces the heaviest and costliest portion of the work. The ascent is continuous; once gained, it is never lost, the average rate being 75 feet to the mile; the maximum, 116 feet to the mile, of which there are but 3½ miles. The bulk of the heavy gradient is at 105 feet to the mile, with numerous level intervals interspersed. Thirty per cent. only of the distance is occupied by curves, none of which have a radius of less than 573 feet. The Baltimore and Ohio Railroad has 17 miles, in two stretches of 116 feet grade, with curves of 400 feet radius; and the Virginia Central for many years worked with the unaided locomotive grades of 296 feet to the mile, and ruling curves whose radii were 300 feet. By crossing from one spur and ridge to another, piercing by a number of short tunnels and deep cuts where necessary, the line has been made available for passenger trains to run at 25 miles an hour, and goods trains at half that speed. The time consumed in making the trip, including stoppages, is six hours, with ordinary engines and trains. From Cisco to the Summit most of the heavy rock cutting is now done. The crest of the ridge is pierced by a tunnel of 1,658 feet, the longest on the road, of which about 500 feet remain uncut, and at which men are working night and day the week round, excavating at the rate of seven feet per day. East of the summit the descent is much easier, the great interior basin being elevated 4,000 feet above the sea level. In 14 miles there is a fall of 1,100

feet, after which there is a gentle slope, nowhere exceeding 45 feet to the mile, eastward toward Salt Lake. The greater portion of the line is so sheltered by excavations that it will be necessary to erect sheds over it for two miles only, in order to shoot the snow-slides clear of the track. Provision is made in the larger tunnels and heavy cuttings for a double line, which, from present indications, will be necessary at no distant day, to accommodate the growing traffic. The original estimated cost of building the road across the Sierras was slightly above that of the most expensive railroads in the country where the right of way had to be purchased at considerable cost; and compared as follows:—

	Per Mile.
	Dollars.
Boston and Providence Railroad cost	81,273
Boston and Lowell Railroad cost	78,636
New York and Erie Railway about	80,000
Hudson River Railroad about	80,000
Central Pacific (Mountain Division) estimated	88,400

Up to the 1st January last the Central Pacific Company had expended in building the 94 miles in operation, together with about a third of the preparation upon 25 miles additional, and for a liberal equipment of rolling stock, nearly 15,000,000 dollars. The total cost of this mountain section will be about 100,000 dollars per mile. The rest of the distance to Salt Lake City, 575 miles, can be constructed for about 60,000 dollars per mile.

Colonies.

THE STATE OF QUEENSLAND.—With such a small population in proportion to the extent and value of its territory, Queensland is dependent on immigration for its prosperity and the development of its resources. The wealth of the colony in land and minerals is only in process of discovery. Every year increases the knowledge of what can be profitably extracted from the soil or from beneath the surface. This wealth cannot be rendered available without a constant inflow of population for years to come; nor can it be done by a mere increase of numbers, without reference to their suitability for colonists, or to the other surrounding circumstances. It has been experienced that the sudden arrival, in large numbers, of people without any means, but entirely dependent on the receipt of wages from the day of their landing, so disarranges the relative proportion of employers and employed as to cause much misery, and even to give the appearance, for a time, of a superabundance of population in some districts. This evil cannot be cured by a total stoppage of immigration of every sort, though it necessitates a cessation of that particular description which has been carried on to excess for some time past, and a large portion of which has been a source of loss to the colony. The present position of this country is by no means an exceptional one. Every young community, unless it absolutely stands still, like Western Australia, or retrogrades, like Tasmania, is sure to have a recurrence of periods of undue inflation, followed by seasons of more or less prostration. Old residents of each of the Australian colonies will all testify to the fact that every one of them has, in its turn, passed through far harder times than have been seen here. They have invariably and quickly recovered, through having their energies forcibly directed to the necessity of increased production; and the prosperity which has followed has been in proportion to the increase of numbers attracted by those resources the availability of which has been proved in consequence of the pressure of the times.

THE ALPACA IN NEW SOUTH WALES.—A Sydney paper says:—"It is unfortunate that the attempts to naturalise the alpaca near Sydney have not been successful. For some time those in Paramatta-park did very well, but several have died lately, and the

number is reduced to three. It is intended to remove these to higher land, under care of some member of the society who may be willing to take charge of them."

EDUCATION, &c., IN VICTORIA.—This colony expends £130,000 per annum in furnishing the people with the means of instruction, and three-fourths of the whole population are able to read, and nearly two-thirds to read and write. It maintains a free public library, containing over 40,000 volumes, besides a museum of art and a museum of the natural sciences; there are institutions for the relief of almost every conceivable form of human suffering; there are about 1,700 places of public worship; upwards of 300 branches of various benefit societies, with a revenue exceeding £60,000 per annum; nearly 18,000 savings' bank depositors, with more than £700,000 standing to their credit, besides £15,000 lodged in the Post-office savings' bank. There are upwards of 900 manufactories, with a capital exceeding two millions sterling, giving employment to 10,000 people; the export and import trade represents an aggregate of over £26,000,000, being more than £42 per head. There are upwards of 276 miles of railway in operation, and more than three thousand miles of telegraph wires.

AGRICULTURE IN VICTORIA.—The harvest returns of 1866 show that about 6,000,000 bushels of wheat, oats, and barley, and 83,166 tons of potatoes were raised; and the calculations of the Registrar-General show that there are about one hundred head of cattle, 14,000 sheep, 20 horses, and about 12 pigs to every 100 men, women, and children in the colony. At present the skilled labour receives from 8s. to 10s. for eight hours' labour; the farm labourer 8s. to 12s., with board and lodging; day labourers, 5s. to 7s. per day; and female domestics, £25 to £30 per annum; while bread is 6d. per loaf, and meat 6d. per pound. There has been a steady decline in wages during the last 13 years, which is mainly to be traced to the cessation of immigration.

EMIGRATION IN 1866.—The following is a statement of the number of persons who emigrated from England to the Australian and New Zealand colonies last year, showing a decrease of not less than 13,186 persons, as compared with the number in 1865:—

New South Wales	1,648
Queensland	6,054
Victoria	8,531
South Australia	3,392
West Australia	167
Tasmania	7
New Zealand	4,298
 Total	 24,097

Notes.

INTERNATIONAL CO-OPERATIVE CONGRESS.—An international congress is announced to take place in Paris, on the 16th, 17th, and 18th of the present month of August, under the presidency of a well-known writer on political economy, M. J. E. Horn. The questions to be discussed are: 1st. The division of profits amongst members of co-operative societies, and the application of funds to various purposes; 2nd. The correspondence of co-operative associations in France, and between those and foreign associations; 3rd. The utility of these associations in agricultural districts, and the means of furthering the movement in that direction; 4th. The application of co-operation to public instruction by means of libraries, adult classes, and instruction of various kinds; 5th. The liability of members of co-operative societies beyond their subscriptions. Foreign associations are invited to send delegates to represent them at the congress. The fee is fixed at ten francs, which confers a right to a copy of all publications of the congress. The council an-

nounces that strangers may address the meetings of the congress in their own language, arrangements having been made for giving immediately a *résumé* of such speeches in French. The meetings are to be public, admission to be obtained by payment of half a-franc. Subscriptions received at the offices of the Société du Crédit au Travail, 3, Rue Baillet, Paris.

FIRE-PROOF DRESS.—M. Champy, a lieutenant in the French navy, has just exhibited at Billancourt an ingenious arrangement, of his invention, to enable persons to approach the centre of a conflagration, in order to suppress it, or to save other persons from the flames. The principle of his invention may be stated in a few words, —the wearing of a dress continually saturated with water. He places over his head a conical woollen hood, with eye-pieces, dresses himself in woollen garments and gloves, and fastens a strong belt round his waist, from which depend the branch in connection with a fire-engine, and a tube with a stop-cock, by means of which he can saturate the conical cap and all the rest of his equipment. Some faggots saturated with benzine were set on fire, and in a few seconds M. Champy put on his dress, saturated it with water, and, approaching close to the burning mass, extinguished the fire without difficulty.

GENERAL CEMETERY FOR ALL PARIS.—An inquiry has been opened by the authorities of Paris on a subject which has been for some time under consideration, namely, the formation of a general cemetery for the whole metropolis, at a spot near Pontoise, in the department of the Seine and Oise, distant about twenty miles from Paris, and of a special railway in connexion with it. Outlines of the project are now open to the public at the Prefecture of Paris and the sub-prefecture of St. Denis; and all persons interested in any way in the subject are invited to make their observations, in books kept for the special purpose, between this and the 16th of August.

GREAT MUSICAL PRIZE IN FRANCE.—The Institute of France has, at the instance of the Academy of the Beaux Arts, conferred the biennial prize of 20,000 francs on M. Félicien David, author of the "Desert," "Herculanum," "Lalla Rookh," and many other works.

MUSEUM OF THE CITY OF PARIS.—The municipal museum now being formed at the Hôtel Carnavalet in Paris will, it is said, be shortly opened to the public. It will comprise eight sections or divisions:—1. Charters and original manuscripts relative to the history of Paris. 2. Seals, medals, and tokens. 3. Sculpture, and objects of archaeology. 4. Prints and miniatures. 5. Pictures representing various important events which have occurred in Paris, the monuments and the aspect of the city, or persons famous in its history. 6. Books published in Paris. 7. Specimens of the productions of the principal trades. 8. Furniture, and historic costumes.

SCIENTIFIC BALLOON ASCENTS IN FRANCE.—M. Flammarion made his eighth ascent the other day, with a companion, in a balloon of moderate size, called the "Imperial." In order to make certain observations it was necessary that the aéronaute should pass at least once through the rain and through the clouds which yielded it, and this object was accomplished; they passed the whole night in the region of the meteors, one occupied with the direction of the balloon, the other with his observations. Leaving Paris early in the evening, they passed the frontier into Belgium about midnight, near Rocroi, having passed to the right of the towns of Daunmartin, Soissons, and Laon. Afterwards passing to the left of Namur, Liege, and Aix-la-Chapelle, the balloon entered Prussia at the break of day. Before midnight it rained, and the balloon had great difficulty in piercing the clouds; but after that time the sky became clear, and the moon shone brightly. Before daybreak M. Flammarion was principally occupied with observations respecting the formation of the clouds, and during this time they were between 5,000 and 8,000 feet above the surface of the earth. At the latter elevation at daybreak, the thermometer

stood at 2° centigrade. The observations generally referred to the condensation of the watery clouds and the temperature of the air in the upper regions. At five in the morning the aéronautes found themselves over the Rhine, and their ballast being exhausted, they thought it prudent to descend, which they did near Solingen, in the department of Düsseldorf, about ten leagues from Cologne, and four hundred miles from Paris. M. Flammarion intended to make a second ascent, and with this view three small balloons were attached to the larger one, whereby the last was kept inflated during the whole day, but the second ascent was not attempted, probably on account of the unfitness of the weather. Previous to the ascent above referred to, another was made in the great balloon the "Giant," but the rents in the silk, and the weight of the car and its contents, marred the intended voyage.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 24th July, 1867.

Par. Numb.
 263. Bill—Weights and Measures (Dublin).
 269. " District Lunatic Asylums Officers (Ireland) (amended).
 271. " Poor Law Board, &c. (amended).
 272. " Offices and Oaths (Lords Amendment).
 399. East London Water Bills, &c.—Report from the Select Committee.
 429. Factory Acts Extension and Hours of Labour Regulation Bills—Report from the Select Committee.
 433. Paris Exhibition—Report from the Select Committee.
 436. Corrupt Practices at Elections Bill—Minutes of the Proceedings.
 449. East India (Army)—Return.
 465. Navy—Supplementary Estimate (Vote No. 1, Wages to Seamen and Marines).
 National Education (Ireland)—Thirty-third Report of the Commissioners.
 Donaghmore Riot—Report of the Commissioners, &c.
Delivered on 25th July, 1867.

274. Bill—Merchant Shipping.
 402. Loan Societies—Abstract of Accounts.
 444. Population of Towns—Returns.
 445. Mortality and Marriages—Return.
 447. Oyster and Mussel Fisheries—Report of the Board of Trade.
 461. Civil List Pensions—List.

Delivered on 26th July, 1867.

221. Bill—Companies Act (1862) Amendment.
 268. " Sea Coast Fisheries (Ireland) (amended).
 273. " Parks Regulation (amended).
 275. " Pier and Harbour Orders Confirmation (No. 2) (Lords Amendments).
 276. " Consecration of Churches and Churchyards.
 277. " Prorogation of Parliament.
 278. " Patriotic Fund.
 280. " Indemnity.
 281. Bank Post Bills (Ireland).
 443. Sea Coast Fisheries (Ireland) Bill—Report from the Select Committee.
 459. Brentwood Grammar School—Correspondence.
 463. Trinity College (Dublin)—Returns.
 469. Civil Services—Supplementary Estimate.
 Science and Art Department—Fourteenth Report.
 Colonial Possessions—Statistical Tables (Part XI., 1864 and 1865).

Delivered on 27th July, 1867.

283. Bill—Guarantee of Government Officers (amended).
 427. Poor Relief (Ireland)—Abstract of Return.
 558. Brown's Charity—Correspondence.
 474. Ecclesiastical Residences—Return.
 Public Petitions—Thirty-fifth Report.
Delivered on 29th July, 1867.

222. Bill—Sea Fisheries.
 284. " Public Health (Scotland) (amended in committee on re-commitment and on second re-commitment).
 285. " Fortifications (Provision for Expenses) (No. 2).
 287. " Courts of Law Fees, &c.
 289. " Naval Stores (No. 2).
 441. Grand Jury Cess (Ireland)—Return.
 457. Poor Law—Return.
 460. Thames Conservancy—General Report.
 464. Simla Court Martial—Proceedings.
 464. (i.) Simla Court Martial—Despatch.
Delivered on 30th July, 1867.

261. Bill—Intestates' Widows and Children (Scotland).
 416. Public Debts—Return.
 466. Army—Returns.
 473. National Education (Ireland) (Denominational System)—Answers.

Delivered on 31st July, 1867.

288. Bill—Expiring Laws Continuance.
 291. " Dominica Loan.

46. (vi.) Trade and Navigation—Accounts (30th June, 1867).
 457. Poor Law Return (corrected).
 472. National Education (Ireland) (Classics and French)—Proposal or Plan.
 485. Quarantine Regulations—Return.
 Ceylon—Petition.

Patents.

From Commissioners of Patents' Journal, August 2nd.

GRANTS OF PROVISIONAL PROTECTION.

Aeronautical apparatus—2115—J. W. Butler and E. Edwards.
 Alcohol—2011—W. E. Newton.
 Boiler tubes, cleaning—2086—J. Mannock.
 Boilers—2107—T. D. Walker.
 Boots and shoes—732—A. W. Moore and E. McNeal.
 Boxes, drawers, &c.—1715—G. P. Hill.
 Brick-making machinery—2128—R. Shaw and J. Stirk.
 Button fastenings—2093—C. M. Tate.
 Carding engines—2112—R. T. Bradbury and T. Bottomley.
 Casks, &c., cleaning—2135—J. Walker.
 Cotton, ginning—2087—W. McAndrew.
 Fabric, woven—1189—J. D. Brickles.
 Fluids, &c., induction of—2106—A. Morton.
 Gas—2004—J. J. Buckley and C. Hook.
 Glass for tablets, &c.—1914—G. Rees.
 Glass, furnaces for manufacturing—2075—F. D. Nuttall.
 Looms—2103—W. R. Lake.
 Looms—2111—J. J. and E. Harrison.
 Meat, &c., preservation of—2079—T. Redwood.
 Metal bars, bending, &c.—2105—W. Barningham and J. Thompson.
 Paper-making machinery—2085—G. W. Hayes.
 Petticoats—1459—A. Angot.
 Pictures, &c., suspending—2129—W. Potts.
 Pipe joints—2124—A. Budenberg.
 Plaster castings, hardening, &c.—2131—B. P. Franzoni.
 Printing machines—1534—A. M. Clark.
 Printing machines—2113—A. Paton.
 Railway carriages, &c., ventilating—2126—W. G. Creamer.
 Railway crossings, &c., preventing accidents at—2123—C. F. Whitworth.
 Railway points and signals—2119—J. Saxby.
 Reaping and mowing machines—1952—R. Hellard.
 Rudders—2118—P. H. Metham.
 Smoke, consuming, &c.—2099—S. C. Lister.
 Spanners—2108—J., and T. Palmer.
 Spinning machines, &c.—1932—J. Elce and P. Williams.
 Steam engines—2101—J. R. Swann.
 Steel, &c., utilizing products obtained during the manufacture of—2114—J. Hargreaves.
 Tables—1533—O. Rodolphe.
 Taps—2133—H. Lea.
 Types, printing from a chain of—1948—J. McAdams.
 Ventilators—2130—J. Hooper.
 Wine, &c., escape of carbon from casks of—2122—T. Bromwich.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Lamps in carriages, securing—2157—W. Howes and W. Burley.

PATENTS SEALED.

315. I. Liebich.	366. T. Gill.
324. J. G. Tongue.	371. J. Brigham & R. Bickerton.
325. J. Wright and T. Cobley.	392. J. H. Johnson.
330. G. A. Waller.	1335. E. Bourdon.
344. G. E. Pain and C. Corroy.	1338. R. Marsden & U. Bromley.
346. R. E. Green & W. Laycock.	1598. A. V. Newton.
350. F. C. Leader.	1658. I. M. Millbank.
358. W. S. Losh.	

From Commissioners of Patents' Journal, August 6th.

PATENTS SEALED.

343. W. G. Beattie.	395. F. Bacon.
347. W. T. Carrington.	399. A. J. Paterson.
360. T. Sibley.	426. J. Combe.
361. H. A. Fletcher.	428. J. Ferrabee.
368. R. Haworth & J. W. Welch.	430. E. Lord.
369. G. Daws.	496. T. King.
377. C. W. Dixon.	569. W. E. Newton.
378. E. Gorges.	677. M. A. F. Mennons.
384. R. T. Thompson.	1717. S. W. Wood.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1851. W. Clark.	1931. C. Garton and T. Hill.
2118. J. Campbell.	1932. A. L. Wood.
1941. F. Cruickshank.	1940. G. E. M. Gérard.
1944. A. Long.	1952. J. Lee.
2136. A. E. Peirce.	1946. G. F. Druce.
1920. J. H. Johnson.	1951. J. Heydon.
1926. E. Frasier.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1856. J. Goucher.	1979. W. Walton.
1887. J. Rives.	1895. J. Higgins and T. S. Whitworth.